Progress Report
April, 2010
Project Title: Enabling the Transition of CPC Products to GIS Format
Period of Project: 2008 to 2011

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Abstract

The mission of NOAA's Climate Prediction Center (CPC, www.cpc.ncep.noaa.gov) is to serve the public by assessing and forecasting the impacts of short-term climate variability, emphasizing enhanced risks of weather-related extreme events, for use in mitigating losses and maximizing economic gains. In order to continue to fulfill this mission and to respond to customer demands for improved climate information, CPC needs to transform its suite of climate monitoring, assessment, and forecast products into GIS format. An interactive, web-based system will be developed to allow the public to manipulate and display CPC data and derived products together with geographical information such as topography, natural features, human settlement and infrastructure, and demography. This project will provide critical software development for the enrichment of the CPC climate product suite: new products based on multi-member and multi-model ensemble forecasts, and the conversion of all CPC products into GIS format. The proposed software development, while targeted for CPC, will also help other organizations producing climate-related datasets. The increased availability of climate-related GIS data will lead to greater community engagement and ultimately to improved climate products and assessments.

Year 2 Progress Report:

The project goals are to provide critical software development for the enrichment of the CPC climate product suite and enable new products based on multi-member and multi-model ensemble forecasts, resulting in the conversion of most CPC web products into GIS format. To achieve these goals, the GrADS software package is being enhanced to provide new GIS input and output capabilities and to provide new analysis tools for multi-member and multi-model ensemble data sets.

Recent enhancements to GrADS include new capabilities to facilitate the analysis of ensemble data sets. GrADS now has a 'virtual' time dimension, where time may be expressed in terms of a forecast time (time offset since initialization) instead of an actual calendar date. When analyzing forecast data, it is useful to reference time in terms of an offset, especially when the members of

an ensemble set have different initial times and the user wishes to evaluate each member's performance at a given lead time. The virtual time dimension (implemented as an "offt" dimension override) was included in GrADS version 2.0.a7 released August 2009. All the described software enhancements are fully integrated into the GrADS software package including the build process and the online documentation. See http://www.iges.org/grads.

Also released in 2009 was the previously reported on capability for GrADS to output the GIS image formats of GeoTIFF and KML. This capability is now being used operationally at CPC. See Figure 1.

The latest release of GrADS (version 2.0.a8, released March 2010) introduced the capability to draw and query the contents of a shapefile. The shapefile format stores non-topological geometry and attribute information for the spatial features in a data set. Shapefiles typically contain data related to coastlines, political boundaries, state or county boundaries, climate zones, roads, rivers, topography, etc. GrADS is able to draw the contents of a shapefile (whether it contains points, lines, or polygons) as an overlay on top of an existing plot. The GrADS shapefile interface also allows the user to discover the contents of a shapefile and the attribute values in the associated data base.

Figure 2 illustrates how the contents of a shapefile (e.g. the U.S climate zones) are drawn with GrADS. Individual polygons representing each climate zone is colorized according to values of the Palmer Drought Severity Index. Relevant meteorological data is overlaid to provide a larger-scale context. In this example, a strong negative 500mb height anomaly that persisted for several months in the summer of 1993 coincided with record flooding across the Midwest.

The final phase of the project will enable GrADS to produce output in the shapefile format. A development version of GrADS is in the testing stage for producing two types of shapefiles: points and lines. For the point shapefiles, we use the data from each individual grid cell and create a shapefile containing the grid cell locations and their data values. For the line shapefiles, we use the output from the contouring routine and create a shapefile containing the contour lines and their contour levels.

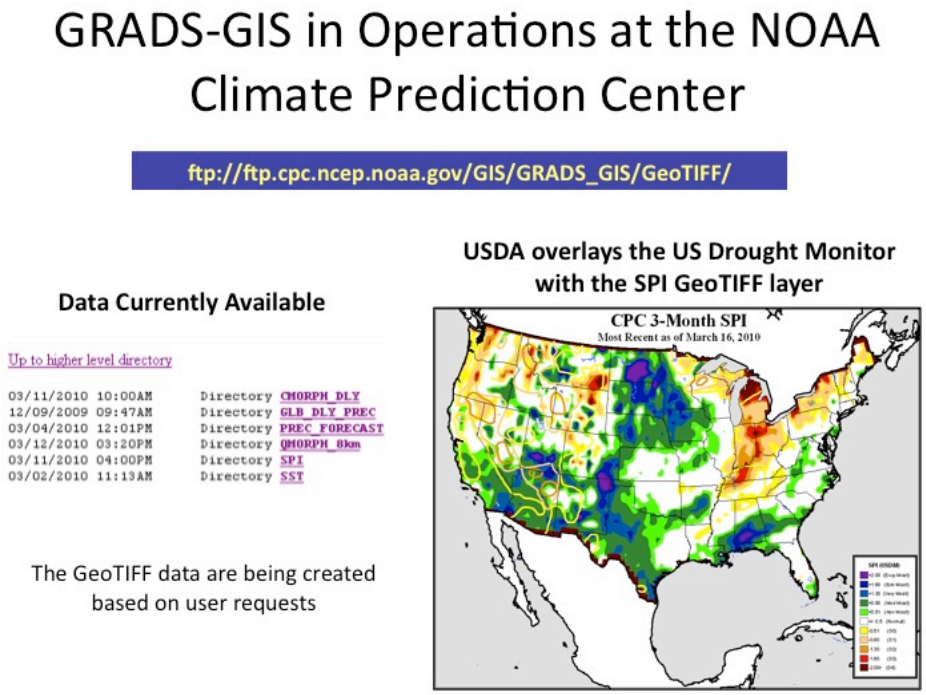

Figure 1: Use of GrADS' GeoTIFF output capability by CPC.

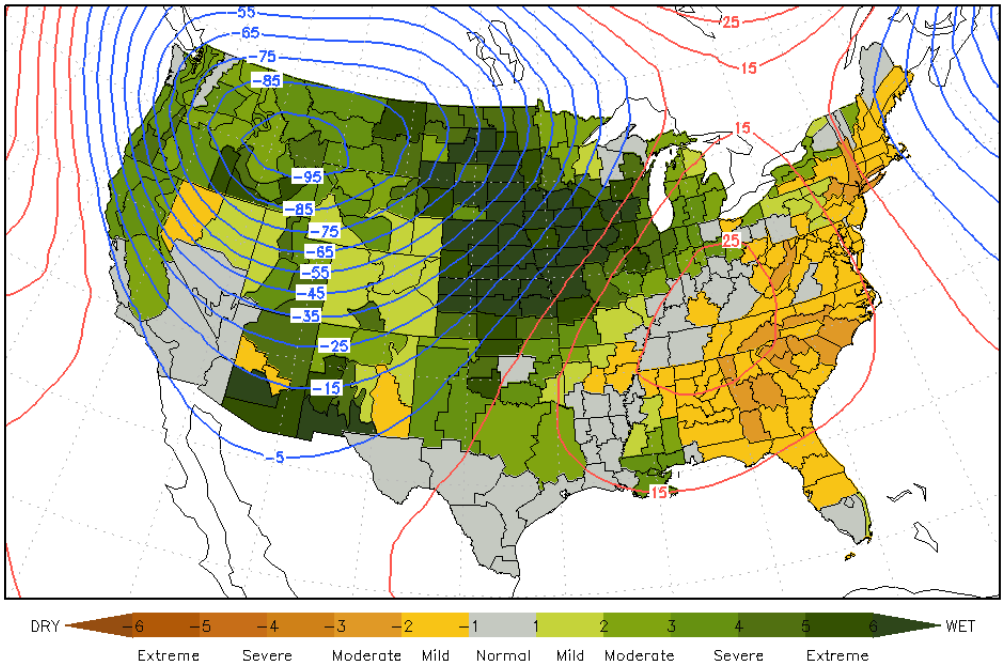

Figure 2: Palmer Drought Index values rendered from a Shapefile, overlaid with 500mb height anomalies, for July 1993.